

Claim Listing

Please cancel claims 12-14, 17-20, 22-23, and 28-31.

1. (Currently Amended) A method of ~~efficiently~~ storing an effective address (EA) in an effective to real address translation (ERAT) table supporting multiple page sizes including a base page size, wherein the ERAT table comprises a plurality of entries, the method comprising the steps of:

adding a plurality of page size indicator (PSI) fields, ~~based on the number of unique page sizes supported~~, to each entry of the ERAT [[entry]] table, wherein the PSI fields of each entry are used to store values that collectively specify either: (i) one of the supported page sizes, or (ii) that an effective address stored in the same entry of the ERAT table does not need translation, and wherein at least one combination of the values of the PSI fields of each entry specifies that the effective address stored in the same entry does not need translation;

storing ~~[[an]]~~ the EA [[using]] in one of the entries of the ERAT [[entry]] table; and

setting the values of the PSI fields of the one of the entries of the ERAT [[entry]] table to [[indicate the]] specify either: (i) a page size of the EA, wherein the page size of the EA is one of the supported page sizes, or (ii) that the EA does not need translation.

2. (Original) The method of Claim 1 wherein a PSI field is added for each unique page size, including the base page size.

3. (Currently Amended) The method of Claim ~~[[2]]~~ 1, wherein ~~the PSI fields are used to indicate that the ERAT entry for a translation disabled address does not need translation~~ the supported page

sizes include the base page size and at least one other page size that is an integer multiple of 2 times the base page size.

4. (Currently Amended) The method of Claim 3, wherein each entry of the ERAT table is also configured to store a plurality of state bits, and wherein all [[translation-disabled]] effective addresses that do not require translation and have the same state bits [[and the same EA]] share the same entry of the ERAT [[entry]] table.

5. (Currently Amended) The method of Claim 1, wherein ~~a PSI field is added for each unique page size, but not for the base page size~~ each added PSI field is configured to store one binary digit.

6. (Currently Amended) The method of Claim ~~[[5]]~~ 1, wherein ~~a translation-disabled indicator (TDD) is used to indicate that the ERAT entry for a translation-disabled address does not need translation~~ ($m+1$) PSI fields are added to each entry of the ERAT table, and wherein m is an integer, and wherein m of the ($m+1$) PSI fields are used to store values that collectively specify one of the supported page sizes, and wherein the remaining one of the ($m+1$) PSI fields is used to store a value that specifies whether the an effective address stored in the same entry needs translation.

7. (Currently Amended) The method of Claim 6, wherein ~~a translation-disabled address is not stored in the ERAT~~ each of the ($m+1$) PSI fields added to each entry of the ERAT table is configured to store one binary digit.

8. (Currently Amended) The method of Claim 1, wherein the effective address (EA) stored in the ERAT table is used to translated another effective address to a real address (RA) ~~using the ERAT table.~~

9. (Currently Amended) ~~The method of Claim 8, further comprising:~~

~~dividing the EA into ranges, based on the number of page sizes supported;~~

~~comparing the EA to each entry in the ERAT;~~

~~determining whether the EA is translation disabled;~~

~~upon determining the EA is translation disabled, outputting the EA as the RA;~~

~~upon determining the EA is not translation disabled, determining which EA ranges should match, in order for the EA to match the ERAT entry, by checking the PSI fields for each ERAT entry;~~

~~upon determining which ranges should match, determining if there is a match by comparing the appropriate ranges of the EA and the ERAT entry;~~

~~upon determining the EA matches an ERAT entry, looking up a corresponding data array address (DAA) in a data array (DA) table;~~

~~using the PSI fields to determine which ranges from the EA and which ranges from the DAA should be used for the RA; and~~

~~outputting the appropriate ranges from the EA and DAA as the RA~~

A method for translating an effective address to a real address, comprising:

providing an effective to real address translation (ERAT) table having a plurality of entries each configured to store an effective address, a real address corresponding to the stored effective address, and a plurality of page size indicator (PSI) values that

collectively specify either: (i) a page size of an effective address stored in the same entry of the ERAT table, wherein the page size of the effective address is one of a plurality of supported page sizes including a base page size, or (ii) that an effective address stored in the same entry of the ERAT table does not need translation, wherein at least one combination of the PSI values of each entry specifies that the effective address stored in the same entry does not need translation;

receiving the effective address to be translated;

determining whether the received effective address requires translation; and

in the event the received effective address does not require translation, outputting the received effective address as the real address.

10. (Currently Amended) The method of Claim [[1]] 9, ~~wherein the EA is written to the ERAT entry by determining whether the EA is translation disabled~~ further comprising:

in the event the effective address requires translation:

comparing each of a plurality of ranges of the received effective address to a corresponding range of an effective address stored in each entry of the ERAT table dependent upon the PSI values, wherein the received effective address is divided into the plurality of ranges dependent upon a number of the supported page sizes;

in the event that each range of the received effective address matches the corresponding range of an effective address stored in a particular entry of the ERAT table dependent upon the PSI values;

selecting ranges of the real address stored in the particular entry of the ERAT
table dependent upon the PSI values; and
outputting the real address, wherein the real address includes the selected
ranges of the real address stored in the particular entry of the ERAT
table.

11. (Currently Amended) The method of Claim 10, ~~wherein, upon determining the EA is not translation disabled, the method further comprises:~~

~~determining the page size of the EA;~~

~~upon determining the page size, setting the appropriate PSI fields for the entry to indicate the page size;~~

~~setting the EA field in the entry to the value of the EA provided; and~~

~~writing the entry~~

the supported page sizes include the base page size and at least one other page size that is an integer multiple of 2 times the base page size.

12. (Canceled)

13. (Canceled)

14. (Canceled)

15. (Currently Amended) An apparatus for ~~efficiently storing an effective address (EA) in an effective to real address translation (ERAT) table supporting multiple page sizes, the apparatus comprising:~~

~~means for adding page size indicator (PSI) fields, based on the number of unique page sizes supported, to each ERAT entry;~~

~~means for storing an EA using one ERAT entry; and~~

~~means for setting the PSI fields of the ERAT entry to indicate the page size~~

translating an effective address to a real address, comprising:

means for storing an effective to real address translation (ERAT) table having a plurality of entries each configured to store an effective address, a real address corresponding to the stored effective address, and a plurality of page size indicator (PSI) values that collectively specify either: (i) a page size of an effective address stored in the same entry of the ERAT table, wherein the page size of the effective address is one of a plurality of supported page sizes, or (ii) that an effective address stored in the same entry of the ERAT table does not need translation, wherein at least one combination of the PSI values of each entry specifies that the effective address stored in the same entry does not need translation;

means for receiving the effective address to be translated;

means for determining whether the received effective address requires translation; and

means for, in the event the received effective address does not require translation, outputting the received effective address as the real address;

means for, in the event the effective address requires translation, comparing each of a plurality of ranges of the received effective address to a corresponding range of an

effective address stored in each entry of the ERAT table dependent upon the PSI values, wherein the received effective address is divided into the plurality of ranges dependent upon a number of the supported page sizes;
means for, in the event the effective address requires translation and each range of the received effective address matches a corresponding range of an effective address stored in a particular entry of the ERAT table dependent upon the PSI values:
selecting ranges of the real address stored in the particular entry of the ERAT table dependent upon the PSI values; and
outputting the real address, wherein the real address includes the selected ranges of the real address stored in the particular entry of the ERAT table.

16. (Currently Amended) The apparatus of Claim 15, wherein ~~the EA is translated to a real address (RA) using the ERAT table;~~ the supported page sizes include the base page size and at least one other page size that is an integer multiple of 2 times the base page size.

17. (Canceled)

18. (Canceled)

19. (Canceled)

20. (Canceled)

22. (Canceled)

23. (Canceled)

24. (Currently Amended) A computer program product for [[efficiently]] storing an effective address (EA) in an effective to real address translation (ERAT) table supporting multiple page sizes including a base page size, wherein the ERAT table comprises a plurality of entries, the computer program product having a medium with a computer program embodied thereon, the computer program comprising:

computer program code for adding a plurality of page size indicator (PSI) fields, ~~based on the number of unique page sizes supported~~, to each entry of the ERAT [[entry]] table, wherein the PSI fields of each entry are used to store values that collectively specify either: (i) one of the supported page sizes, or (ii) that an effective address stored in the same entry of the ERAT table does not need translation, and wherein at least one combination of the values of the PSI fields of each entry specifies that the effective address stored in the same entry does not need translation;

computer program code for storing [[an]] the EA [[using one]] in one of the entries of the ERAT [[entry]] table; and

computer program code for setting the PSI fields of the one of the entries of the ERAT [[entry]] table to [[indicate the]] specify either: (i) a page size of the EA, wherein the page size of the EA is one of the supported page sizes, or (ii) that the EA does not need translation.

25. (Currently Amended) The computer program product of Claim 24, wherein ~~the EA is translated to a real address (RA) using the ERAT table~~ the supported page sizes include the base page size and at least one other page size that is an integer multiple of 2 times the base page size.

26. (Currently Amended) ~~The computer program product of Claim 25, further comprising:~~

~~computer program code for dividing the EA into ranges, based on the number of page sizes supported;~~

~~computer program code for comparing the EA to each entry in the ERAT;~~

~~computer program code for determining whether the EA is translation disabled;~~

~~upon determining the EA is translation disabled, computer program code for outputting the EA as the RA;~~

~~upon determining the EA is not translation disabled, computer program code for~~

~~determining which EA ranges should match, in order for the EA to match the ERAT entry, by checking the PSI fields for each ERAT entry;~~

~~upon determining which ranges should match, computer program code for determining if~~

~~there is a match by comparing the appropriate ranges of the EA and the ERAT entry;~~

~~upon determining the EA matches an ERAT entry, computer program code for looking up a corresponding data array address (DAA) in a data array (DA) table;~~

~~computer program code for using the PSI fields to determine which ranges from the EA and which ranges from the DAA should be used for the RA; and~~

~~computer program code for outputting the appropriate ranges from the EA and DAA as the RA.~~

A computer program product for translating a received effective address to a real address,

comprising:

computer program code for accessing an effective to real address translation (ERAT) table
to determine whether the received effective address requires translation, wherein the
ERAT table has a plurality of entries each configured to store an effective address, a
real address corresponding to the stored effective address, and a plurality of page
size indicator (PSI) values that collectively specify either: (i) a page size of an
effective address stored in the same entry of the ERAT table, wherein the page size
of the effective address is one of a plurality of supported page sizes including a base
page size, or (ii) that an effective address stored in the same entry of the ERAT table
does not need translation, and wherein at least one combination of the PSI values of
each entry specifies that the effective address stored in the same entry does not need
translation;

computer program code for determining whether the received effective address requires
translation; and

computer program code for, in the event the received effective address does not require
translation, outputting the received effective address as the real address.

27. (Currently Amended) The computer program product of Claim 26, ~~wherein the EA is written to the ERAT entry, and further comprises computer program code for determining whether the EA is translation disabled~~ further comprising:

computer program code for, in the event the received effective address requires translation,
comparing each of a plurality of ranges of the received effective address to a

corresponding range of an effective address stored in each entry of the ERAT table
dependent upon the PSI values, wherein the received effective address is divided
into the plurality of ranges dependent upon a number of the supported page sizes;
computer program code for, in the event the received effective address requires translation
and each of a plurality of ranges of the received effective address matches a
corresponding range of the effective address stored in a particular entry of the ERAT
table dependent upon the PSI values:
selecting ranges of the real address stored in the particular entry of the ERAT
table dependent upon the PSI values; and
outputting the real address, wherein the real address includes the selected
ranges of the real address stored in the particular entry of the ERAT
table.

28. (Canceled)

29. (Canceled)

30. (Canceled)

31. (Canceled)

Please add the following new claims:

32. (Newly Added) A method for selectively storing an effective address (EA) in an effective to real address translation (ERAT) table supporting multiple page sizes including a base page size, wherein the ERAT table comprises a plurality of entries, the method comprising the steps of:

adding a plurality of page size indicator (PSI) fields to each entry of the ERAT table,

wherein the PSI fields of each entry are used to store values that collectively specify one of the supported page sizes;

performing the following only if the EA requires translation:

storing the EA in one of the entries of the ERAT table; and

setting the values of the PSI fields of the one of the entries of the ERAT table to

specify a page size of the EA, wherein the page size of the EA is one of the supported page sizes.

33. (Newly Added) The method of Claim 32, wherein a translation disabled (TD) indicator provided with the EA determines if the EA requires translation.

34. (Newly Added) The method of Claim 32, wherein a PSI field is added to each entry of the ERAT table for each supported page size except for the base page size.